ENVIRONMENTAL ASSESSMENT BOARD

Ontario

ONTARIO HYDRO DEMAND/SUPPLY PLAN HEARINGS

VOLUME: 95

DATE: Wednesday, December 18, 1991

BEFORE:

HON. MR. JUSTICE E. SAUNDERS	Chairman
DR. G. CONNELL	Member
MS. G. PATTERSON	Member

FARR & ASSOCIATES REPORTING INC.

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ENVIRONMENTAL ASSESSMENT BOARD
ONTARIO HYDRO DEMAND/SUPPLY PLAN HEARING

IN THE MATTER OF the Environmental Assessment Act, R.S.O. 1980, c. 140, as amended, and Regulations thereunder;

AND IN THE MATTER OF an undertaking by Ontario Hydro consisting of a program in respect of activities associated with meeting future electricity requirements in Ontario.

Held on the 5th Floor, 2200 Yonge Street, Toronto, Ontario, on Wednesday, the 18th day of December, 1991, commencing at 10:00 a.m.

VOLUME 95

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THE HON. MR. JUSTICE E. SAUNDERS	Chairman
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MS. G. PATTERSON	Member

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INDEX of PROCEEDINGS

L I S T o f E X H I B I T S

TIME NOTATIONS

---Upon commencing at 10:00 a.m.

THE REGISTRAR: Please come to order. This hearing is now in session. Be seated, please.

THE CHAIRMAN: We seem to be missing Mr. Trivett and Mr. Hunter. Are they here this morning?

THE REGISTRAR: They were here sir, about five minutes or so ago.

---Off the record.

MR. TRIVETT: Sorry, Mr. Chairman. I mistook the time.

JUNE BASU ROY,
KENNETH SNELSON,
ERSKINE LEE FLOOK,
THOMAS EASTON WIGLE,
ALANNA MARY QUINN,
BRIAN JOHN McCORMICK,
REED CAMERON HARRIS; Resumed.

THE CHAIRMAN: Just before we start, I just want to make sure that I, at least speaking for myself, am on the right track here.

Could you turn to page 23 of Exhibit 362, which sets out the hydraulic potential.

MR. TRIVETT: What page?

THE CHAIRMAN: 362, it's the Hydro overheads.

MR. TRIVETT: Yes.

THE CHAIRMAN: We were looking at them yesterday.

MR. TRIVETT: Right.

THE CHAIRMAN: That is a summary of how Hydro arrives at its undeveloped potential and its theoretical potential of 20,777 megawatts is made up of three components: The developed Ontario Hydro, the others, and the undeveloped potential, and all these are the result of inventory that was taken that is reflected in Exhibit 82.

Now, Hydro knows a great deal about its own operations and the Ontario Hydro capacity of 7,256 megawatts and energy of 35,000 gigawatthours is based on pretty firm and hard evidence that is contained in Exhibit 359.

Perhaps, although I am not completely certain of this, it knows a little bit less about the others, the 775 and 4,096 capacity and energy figures on that page, and less again about the undeveloped potential of 12,746, 44,524 capacity and energy figures.

However, those figures are derived from quite an exhaustive inventory that was given. It's all set out in Exhibit 82, which contains a great number of figures and tables which you can derive where those figures came from, as far as Hydro is concerned, to the extent that they may have been updated in Exhibit 359.

Now, am I on the right track about this?

MR. FLOOK: Yes, you are.

THE CHAIRMAN: And it may be that there are some errors in both the Ontario Hydro figures, and the others figures, but if those errors in fact do exist, they will equally be similar errors in the 20,777, so that the undeveloped potential, the bottom line of page 23, is the best estimate that Hydro has of what the capacity is and what the energy is--

MR. FLOOK: That is correct.

THE CHAIRMAN: --for the undeveloped potential.

MR. FLOOK: That's correct.

THE CHAIRMAN: Thank you.

MR. FLOOK: Just for your own information, various authorities publish information on other people's generating facilities and all the statistics and so the information that is regarding other stations is quite accurate.

THE CHAIRMAN: It's similarly accurate as the Ontario Hydro one.

MR. FLOOK: It's similar. We may use actual experience where this may be a statistical number, but in actual fact it's very similar.

CROSS-EXAMINATION BY MR. TRIVETT:

Q. Following that vein, Mr. Chairman, my first question this morning is, Mr. Snelson, does theoretical potential really have a definable limit?

MR. SNELSON: A. Are we talking about theoretical potential for capacity or for energy?

Q. For capacity. Is that what the 2,777 figure is?

A. 20,777.

Q. Yes.

A. It is a theoretical potential for capacity but there are some assumptions that are required with respect to the degree of peaking that would be developed at the site to obtain that figure.

Q. Does that really answer the question as to whether there is a definable limit?

It varies with the assumptions?

A. With that assumption there is a definable limit.

Q. And there would be a number of assumptions, not only a single assumption?

A. There would be a number of assumptions, but the capacity factor assumption is probably the most significant once the head and the flow have been defined.

Q. So the definable limit isn't necessarily 20,777, that is the definable limit based on the assumptions which you are using at the moment?

A. Yes.

Q. Now, if we go to the Mattagami River Exhibit 401 and table 3-1, you show two variations for each site.

THE CHAIRMAN: Hold it. 401?

MR. TRIVETT: That's what we handed out yesterday, Mr. Chairman.

MR. FLOOK: If may just add. The Exhibit 438, which isn't the complete document, and I was mislead by the words on top, it says something about it's from a 1947 report; of course it's not, it's from a 1985 report. The complete report is called "Ontario's Water Power Sites", and it is produced by the Ministry of Natural Resources. The first 10 pages that aren't included go into the whole explanation of how the energy was derived for all the sites and does have a discussion on page 5 of the relationship of potential to installed capacity, and it gives seven different reasons why you can't take the average energy and then directly derive a capacity for that site because there is a number of variables that would influence the capacity.

MR. TRIVETT: Q. The variables that are shown there, do they increase capacity or decrease capacity?

MR. FLOOK: A. Both ways.

Q. They work both ways.

Is that document generally available?

THE CHAIRMAN: Well, I thought you produced it

[10:12 a.m.]

MR. TRIVETT: Well, we produced the excerpt that we had, Mr. Chairman, it doesn't have the explanation of the variables. Perhaps if it would have been available --

THE CHAIRMAN: It's available from the Queen's Printer in Ontario, either from the book store or by mail order? It's a 1985 report.

MR. TRIVETT: Q. And do you think that that's available today?

MR. FLOOK: A. Well, unless there has been an update, I'm sure the Queen's Printer keeps a copy of this. It's very useful and is used by many non-utility generators that are looking for sites.

THE CHAIRMAN: Then just so that I'm clear, there is written in handwritten across Exhibit 438, from a 1947 document on Hydro, and that's not

correct?

MR. FLOOK: That is not correct.

THE CHAIRMAN: It's from a 1985 document?

MR. FLOOK: This is from a 1985 document and the title of the document is Ontario's Water Power Sites, and it's produced by the Ministry of Natural Resources.

MS. PATTERSON: Yesterday somebody said it was revised in 1985. Was it originally produced in 1947.

MR. TRIVETT: That's our understanding, Madam.

MR. FLOOK: I think it's an all new document. All they do in the forward is say that a list of water powers in Ontario was first published in 1925, it was revised and reprinted in '31 and again in 1946.

THE CHAIRMAN: I think if you can spare it, Mr. Flook, we perhaps should mark it as an exhibit so that if it ever has to be referred to we would be able to look at the complete document.

MR. FLOOK: May I get a copy for you? I borrowed this copy from somebody else this morning as I went to work and--

THE CHAIRMAN: All right.

MR. FLOOK: --I'm reluctant to give his copy away.

MS. PATTERSON: You can just xerox the pages we don't already have.

MR. FLOOK: I'm somewhat embarrassed. We can arrange for the xeroxing of the first 10 pages, and the rest of the document is as you have printed there.

THE CHAIRMAN: That's all that's missing is the first 13 pages.

MR. FLOOK: The first nine pages, I should say.

THE CHAIRMAN: Well, my copy begins -- there's a facing page and then it really starts at page 14, goes through to--

MR. FLOOK: Excuse me, yes.

THE CHAIRMAN: --page 67, and then stops. Is that correct?

MR. FLOOK: You're correct. When I flipped through it, the first part that is not reproduced ends at page 13, so then 14 - the one that you have - starts on from there.

MR. TRIVETT: I'm in the position of having given our copy away, Mr. Chairman.

MR. FLOOK: I'm sorry I'm so reluctant to give this one up.

THE CHAIRMAN: Well, that's all right. Perhaps you can get someone to photocopy those pages once you get through it.

MR. TRIVETT: Should we then include those pages as part of the 401, Mr. Chairman?

THE CHAIRMAN: 438.

MR. TRIVETT: Excuse me.

MS. HARVIE: Would it be of assistance if we took the copy and had copies of the first 14 pages made right now for Mr. Trivett's examination?

THE CHAIRMAN: Make several sets of them.

MS. HARVIE: Yes.

THE CHAIRMAN: All right. Now, we are at 401, did you say, Mr. Trivett, which is a document entitled Hydroelectric Generating Station Extension, Mattagami River.

MR. TRIVETT: That's right.

THE CHAIRMAN: It's not a complete document again. I don't know who put this in but it's not a complete document.

MR. TRIVETT: The point that we wanted to raise, Mr. Chairman, is that Table 3-1 shows two variations for each site and, in such circumstances, the question is: What is included in the theoretical potential?

THE CHAIRMAN: Right. Perhaps you can ask that question then.

MR. TRIVETT: Q. That is my question. What is included in the theoretical potential where you have two extensions, one of which you plan to choose; one is 61 megawatts greater than the other?

MR. FLOOK: A. That extract is from the Environmental Assessment Document for the Mattagami extensions and in there, of course, it indicates what the alternative was that was the chosen alternative and that is the one unit extension and that is what's included in the theoretical potential.

Q. Okay. So the chosen extension is the one that's included in theoretical?

A. That's the chosen -- the chosen proposal is a one unit extension on the existing site and a comparable capacity at the Smoky Falls site.

Q. Well then, the next question then logically flowing from that is, that if you had chosen the other alternative, would the theoretical capacity for Ontario have increased?

A. If you had chosen the other one and you were going to do it, yes --

THE CHAIRMAN: What do you mean by the other one?

MR. TRIVETT: Well there are two alternatives and the one which they chose is included in theoretical. If they had made the other choice, then the theoretical --

THE CHAIRMAN: What are the two alternatives, please?

MR. FLOOK: If I may be of assistance.

THE CHAIRMAN: Well, just a minute. I don't know whether the two alternatives are a one unit extension or two unit extension or nominal capacity or total capacity?

MR. TRIVETT: That's my understanding, Mr. Chairman.

THE CHAIRMAN: Which is it?

MR. TRIVETT: The two I'm inquiring about are the 183 and the 244 showing as the one unit extension and the two unit extension.

THE CHAIRMAN: All right. Can you help Mr. Hunter on that, please?

MR. FLOOK: Yes. When the Little Long, Harmon and Kipling generating stations were first built there was, as you saw on your site tour, a location for two more units that could have been added on it.

So when we were evaluating alternatives we looked at adding just one unit at the site or two

units at the site and the economic evaluation concluded that we should only add a one unit extension at each of Little Long, Harmon and Kipling and put in a comparable capacity at Smoky falls.

THE CHAIRMAN: So talking about Little Long now, what is the figure that is included in the undeveloped capacity for this particular extension?

MR. FLOOK: It's 61 megawatts, which is the additional one unit.

THE CHAIRMAN: And it would be the same if it was two units; would it not?

MR. FLOOK: If it's two units it would be 122.

THE CHAIRMAN: I see.

MR. SNELSON: That is shown in Exhibit 359 on page 63.

MR. TRIVETT: Q. Page 63?

MR. SNELSON: A. Of Exhibit 359.

Q. On the back of the same exhibit that we have been looking at, the 401, there are monthly and annual mean discharges in cubic metres in the Mattagami River at Smoky Falls.

MR. FLOOK: A. That is correct, Table 4-2.

DR. CONNELL: Mr. Flook, presumably the

energy would be more or less of the same order with either configuration?

MR. FLOOK: That is correct. And when you look at it, even the energy of the inventories, when you look at it, no matter how it's calculated, it tends to stay the same.

The only area that there's some decision-making process is then, to achieve that energy, what capacity do you install.

MR. TRIVETT: Q. Well looking then at the flows on the back of that exhibit, if we went to the January flow, is that --

THE CHAIRMAN: All right now, hold it. It would be better, if you're talking about Exhibit 401 --

MR. TRIVETT: Yes, Mr. Chairman.

THE CHAIRMAN: And are you talking about a table that is at the end of the exhibit called Mattagami River at Little Long Rapids?

MR. TRIVETT: That is correct, Mr. Chairman.

THE CHAIRMAN: Yes. And it shows data for the years 1963 through to 1982. Is that what you're looking at?

MR. TRIVETT: That is correct.

[10:25 a.m.]

THE CHAIRMAN: What is your question?

MR. TRIVETT: Q. My first question is, is this the source of the flows that you work from? This is supplied by Ontario Hydro, though this record comes from Environment Canada, do I understand it correctly?

MR. FLOOK: A. That is correct.

Q. So are these the flows that Ontario Hydro works from?

A. That is correct, for this particular series of sites, these are the --

Q. These are the flows?

A. These are the types of records. The actual records are not on hard copy, of course, they are on a computer disk.

Q. Right. And at Little Long and Smoky Falls, the flow is 155 cubic metres a second in the January period?

A. In 1970, yes.

Q. The average is...

A. There is a mean which of course is not the same as the average.

Q. Right. Okay, it's the mean then.

A. The mean is 166, yes, for January.

That is cubic metres per second.

Q. I don't understand why the mean is different from the average. It's a different the frequency?

THE CHAIRMAN: Mr. Trivett, the table doesn't show the average, at least I don't see it.

MR. TRIVETT: But it says "mean" at the bottom, Mr. Chairman.

THE CHAIRMAN: Yes.

MR. TRIVETT: We thought that it really is the same as an average and I just wondered why it was called a "mean".

THE CHAIRMAN: Mean is different from average.

MR. TRIVETT: Q. Is the mean the average?

MR. FLOOK: A. It may be. And I am not going to comment on this one because I don't know all the details of what went through. But they use the term "mean", so perhaps we will--

Q. Stick with what they use.

A. --stick with that terminology and then there is no confusion.

Q. There is no definition that you use of mean that is different than average.

A. I'm sorry, I don't prepare these numbers here, and I wouldn't want to assume that mean and average are the same. There may be a very particular meaning for that term.

Q. We thought you might know because you had contributed to the data, but your point is you didn't do the tables.

A. Ontario Hydro did do the table. I personally am not involved with it. So the use of the terminology "mean", which seems to be a standard usage in putting together statistical data, I don't know if the person writing the table up had a particular meaning for that.

So, I would not want to make the generalization that mean and average are the same for this particular table.

Q. Well then, this mean flow is the one which you use to calculate, to arrive at the governing potential of this --

THE CHAIRMAN: What potential? Excuse me?

MR. TRIVETT: Q. The theoretical potential that you have to work to.

MR. FLOOK: A. In actual fact, no. And I will explain.

Generally speaking, if you didn't have all these records that is the number you would use, but when you actually have the record you then use the mean monthly flows, and if you have 50 years of record you put together a computer program that actually uses that data to generate energy based upon the previous 50 years of historical flow, based upon the mean of each month, which is much more accurate of course than a mean for the whole year.

Q. So, the actual figure that comes out would depend upon what program you had put into that computer.

A. It depends upon what was actually measured.

Q. Well, in calculating in the way in which we were calculating it yesterday, we had come to read this as indicating a capacity at this point based upon this mean of 65,620 kilowatts, and the installed capacity is 236,000 kilowatts -- I'm sorry, 183.

Smoky is 236...

THE CHAIRMAN: But we are not talking about Smoky at this particular point.

MR. TRIVETT: Well, they are on the same flow, Mr. Chairman.

Little Long is 183.

THE CHAIRMAN: Where is this cross-examination leading toward? I want to know what it is you are trying to demonstrate here.

MR. TRIVETT: I am trying to determine whether the undeveloped potential which we arrive at in the end --

THE CHAIRMAN: This is analysis of an existing site.

MR. TRIVETT: That is correct.

THE CHAIRMAN: What is it you are trying to show? That's what I am having some real difficulty with.

MR. TRIVETT: The add in and the deductions out leave a net undeveloped potential, and then we bring that down to what appears to be what is available to be developed in Ontario, that's the bottom line of this series of charts.

THE CHAIRMAN: What series, I'm sorry?

MR. TRIVETT: Page 23 and 36, Mr. Chairman, leads you to attainable potential.

THE CHAIRMAN: We have gone over this so many times with you. It doesn't matter whether these figures are accurate or not as long as they are treated consistently in the figure of the theoretical potential of 20,777 and the figure of 7,256. It doesn't matter

if there are some discrepancies. Don't you understand that?

MR. TRIVETT: Yes, I do, Mr. Chairman, it doesn't matter insofar as the undeveloped potential figure is concerned.

THE CHAIRMAN: That's what I thought you said you were trying to get at.

MR. TRIVETT: But when you come to the undeveloped potential and you carry that forward and you arrive as what is labelled as the attainable potential for the future, then what is attainable would appear to be dependent upon what you decide to do with each of the sites and not with what the flows are at the site at a given time because that's what is gone in and out of the developed potential.

Is that not clear?

THE CHAIRMAN: I am afraid it's not clear to me. It may be clear to my colleagues. I just don't understand it.

DR. CONNELL: Mr. Chairman, maybe I can try to clarify.

You say that your calculation lead to the conclusion that the capacity at Little Long was 65,600 kilowatts.

MR. TRIVETT: Oh, that was Smoky. 51,925

is the figure for Little Long, Mr. Chairman.

DR. CONNELL: 51,925. I'm sorry, I just want to understand, is that the incremental capacity or is that the total?

MR. TRIVETT: That's the total.

DR. CONNELL: Total for three units?

MR. TRIVETT: Well, it isn't based on units; it's based on flow. As soon as you decide to put in more units which you can use for peaking, you increase what you can in fact do at that site. It gives you a flexibility, operate it over certain hours presumably.

DR. CONNELL: But we already have installed capacity of, what is it, 122?

MR. TRIVETT: That is correct. And the conclusion one has to come to is that when you get down to attainable potential on what remains in Ontario, then it really depends upon what you do with it as to what the attainable potential is. And the figure that is shown as attainable potential seems to have no meaning.

DR. CONNELL: It seems to me obvious that if you have storage capacity at any site and you used that in what would be a totally irrational way, that is if you stored it all up and ran your generator for only

one minute a day, you could achieve some extraordinary number for capacity but it would be totally meaningless.

MR. TRIVETT: Yes, but without going to that extreme, the question is whether the attainable potential should not presume that you use on the remaining sites comparable technology that you have applied on the developed sites, and therefore you have an attainable potential which is much larger than that which is set forth in these. That's really what I am trying to get at.

DR. CONNELL: But that seems to me to be simply tactical. I mean, there is a limit to how much peaking capacity is needed in the province and there is no point in driving that up beyond the useful limit.

The thing that is not variable is going to be the energy. From any site there is an absolute limit to the amount of energy you can derive and you have a choice of either run-of-the-river or peaking, and if you decide to peak then you can peak to a greater or lesser extent. But that is a tactical consideration that has to be integrated in the whole system.

MR. TRIVETT: Excuse me, I was just going to say, allowing that I agree with that conclusion, Mr.

Chairman, one still comes to the position that we face in Ontario a peaking problem. Our problem is how we can meet peaks.

Q. There is ample for the base load; is that not correct?

MR. SNELSON: A. No.

Q. No?

A. We are not that far away from the situation where we are having as much problem supplying loads during off-peak times as we have during peak times. That was the discussion, I believe there was some discussion in Panel 4, but I also gave that discussion again in my direct evidence, as to the amount of potential there would be for pumped storage.

It is because the off-peak problems are not that far behind the peak problems, that we have limited amounts of pumped storage that are useful and limited amounts of peaking hydraulic that are useful.

I believe in my direct evidence I kind of categorized them as limited amounts of empty megawatts that can be useful to the system, that's megawatts of capacity with little or no associated energy.

Q. Well, perhaps I was misled in our discussion of this by -- if you want to turn, Mr. Chairman, to the original Balance of Power, in the Plan

report, Exhibit 3, and look at the annual load shape, figure 7-11A at page 7-15.

Do you all have that?

A. Yes, I have that.

Q. When you look at your December peak, and we understood that this is what you were trying to -- the December flow is the governing month, did I misunderstand that?

A. The capacity available in the winter is usually the most critical part of our system. So we are usually closest to reliability problems on a very cold day in the winter, usually a working day, sometime in the months of December, January or February, depending on when the really cold spell occurs and whether it occurs on the week day or weekend.

[10:37 a.m.]

Q. Well now, how does your average load -- you say you have almost as much of a problem with that?

A. Yes. We already have peaking hydraulic capacity that can be run for peak hours but can't be run during off-peak hours; we already have interruptible loads that we can rely upon to cut during peak times which can only be cut for limited periods of time, and we have programs in our demand management

program for load shifting that will shift load from peak times to off-peak times.

And most of those load shifting mechanisms and peak leveling mechanisms -- peak mechanisms help to meet our peak problem, but don't help to meet the energy problem, and most of them in terms of shifting load around, do so within a day or a few days.

Very few of them allow us, for instance, very little potential to shift peak load from a winter peak time to an off-peak time on a weekend in the spring when the load is lowest.

And so the amount of potential that there is for shifting of load from peak to off-peak times is somewhat limited.

I believe that Mr. Shalaby discussed this in his Panel 4 evidence which is part of Exhibit 260, and what he essentially did was he took a figure similar to figure 7-11B, which is a daily load shape--

Q. Yes.

A. --which is at the bottom of the figure.

Q. Yes.

A. And if you're shifting load within a day, and the best you can do is to make that daily load

shape flat, given that you already have peaking hydraulic capacity you wouldn't want to go that far. You would want to go to the point where the load on thermal generation - that's fossil generation and nuclear generation - is flat.

And he did calculations in Exhibit 260, and I believe it's pages 52, 53 and 54, which showed that if you shifted something around a 1,000 to 1,500 megawatts from the peak and if that load reappeared during the off-peak periods, then you would get to the point where your off-peak situation on a high load day is as critical as it is during the peak period on a high load day and that is potential that is limited for load shifting.

For peaking hydraulic you can go a little beyond that if you have water storage that allows you to shift loads over a period that is greater than a day; say, within a week, and so you can go further than that with peaking hydraulic. You can't usually go further than that with pumped storage and you can't go further than that with load shifting, but you can still only go a limited way beyond that.

Q. Well, taking the pumped storage example, we were going to talk about Delphi Point a little later, but if you brought that in now and

suppose that you had decided to put a few thousand megawatts of pumped storage in Delphi Point, would that not give you that kind of control?

A. Pumped storage is an alternative to the load shifting.

Q. Yes.

A. And if we had not decided to pursue a load shifting program we could probably have accommodated of the order of a 1,000 to 1,500 megawatts of pumped storage.

Q. Does that not meet your critical shift load more satisfactorily rather than coming close to your limits?

A. We had decided through our considerations of the demand/supply planning strategy and the demand/supply option study that we believed that it is less expensive to achieve the degree of load leveling that is required by load shifting of demand rather than by pumped storage, which you could think of as generation shifting of generation.

Q. But I would have thought that you had the base load in the off-peak hours at night looking at your chart, that you could simply continue the pumping during the night and have it -- the peaks are always during the day; are they not?

A. That is correct, but if you have too much pumped storage or too much load shifting, then you get to the situation where you don't have the extra generation at nighttime to pump the pumped storage.

MR. TRIVETT: Excuse me, Mr. Chairman.

Well, I don't know if we really should be getting into this at this point in time because we're really getting into the demand/supply option, Mr. Chairman, and I feel that perhaps it's usurping the place here to have this argument and perhaps it should be in my clients' own presentation.

Q. I think perhaps we have made the point now as far as this is concerned, that the end result of what is available, what is attainable hydraulic in Ontario is very much a variable depending on how you use it. And we show it as a figure at a given time, but is that figure -- I don't see that figure as an absolute.

MR. SNELSON: A. No, the figure is not absolute. We do, as we have said, there are implied assumptions about capacity factor for each of the individual sites that goes into the attainable potential or the theoretical potential and the numbers that we have given are based on our best estimates at this time.

We did indicate in our direct evidence that a change was being considered for the Niagara development that would reduce the amount of capacity by 400 megawatts because we didn't believe that the extra 400 megawatts was contributing very much to the system because there was very little energy associated with it and very little water storage associated with it.

MR. FLOOK: A. If I may add something, you are assuming that all of the theoretical potential, other than what has already been developed, is arrived at by strictly applying these theoretical principles but, as in my direct evidence and in the evidence in the DSP, certain sites have already had some sort of studies done and those studies are to the point of being able to more certainly define the head, what is the appropriate head for the site and what is the appropriate type of capacity.

The term attainable potential is Ontario Hydro's, what they are using within this forum, it is not what is attainable by anybody in Ontario, it is what we are looking at, not seeking approval for.

The potential areas that make up this attainable development, some of them already are in the definition phase and environmental assessments have been submitted, there has been extensive studies done

for them and, therefore, there is a great amount of certainty to the values that are put forth as attainable development.

The parts that fall in that attainable development are not ones that are just taken strictly out of the unsurveyed sites that make up part of this inventory.

So, there is a certainty to the information as provided in that attainable development.

Q. It then follows that as other sites are studied there may be new, greater certainty to larger numbers than are presently used?

A. Within the amount of energy capacity that Ontario Hydro is seeking approval, those studies have been done and there is knowledge.

As you get farther out, perhaps in longer term planning, yes, as you did more studies you would have more certainty upon the actual technical information associated with each individual site.

Q. So nobody is trying to put forward what the ultimate attainable might possibly be, it's just not a present concern?

A. What we are showing as attainable development is what Ontario Hydro is putting forth for what their plans are within this Demand/Supply Plan.

Q. Without it being a limitation though on what might be at the next hearing. The attainable at the next hearing could be quite a larger figure, quite a different figure?

A. A hearing 10 years from now might have quite different numbers.

DR. CONNELL: But not for the energy.

MR. FLOOK: No, you are very correct, the energy stays -- will stay very much the same. A slight variation depending upon your calculation and assumed efficiency but, in general, it would be the same.

THE CHAIRMAN: So I suppose if somebody felt that there should be greater hydraulic capacity included in the plan, they could argue that your analysis could be expanded to increase that; would that be right?

MR. FLOOK: You could do more studies on other sites, yes, but I think, once again, within what Ontario Hydro feels they can achieve, they have put forth what they feel is a reasonable number.

MR. TRIVETT: Q. Well, while the energy may be a constant, the number of dams that you actually use generation at increases your production on exactly the same energy flow; does it not?

MR. FLOOK: A. I'm sorry, I don't

understand.

Q. For example, if you took a system of head ponds and you put in generation at each of those ponds, that water is flowing in any event and it has its drop in any event. When you say the energy is limited, the energy is limited by the number of sites which you specify?

A. That is correct.

Q. So if you use more sites on the same fall, you've increased your energy?

A. Somebody has ascertained that they feel that what is proposed as a reasonable number of sites to develop the fall in that stretch of river.

Q. And that is based on certain assumptions that somebody else --

A. Somebody had done an analysis.

Q. Somebody has done an analysis and a different analysis could come to a different conclusion, even on the energy. So the energy itself is not necessarily a constant either because you are developing more sites; am I wrong?

A. I think what has been identified, and if you look at this book, and has been done in great detail, of what the potential sites are, I think there has been canvassing of potential sites within Ontario

and there is a reasonable expectation that there may be some variance in the energy but, in general, the total -- when you draw the bottom line after all these pages, is sort of an upper limit with some, of course, variation, some slight variation due to specifics of the site.

Q. Well then, might I just --

THE CHAIRMAN: Just a moment. This book is Exhibit 438.

MR. TRIVETT: Yes.

MR. FLOOK: Yes, I apologize.

MR. TRIVETT: Q. Now, when you go to the maps, which you gave us as Exhibit 363, and you talk here about -- the extension is a map, 364, and you differentiate between those sites which are Ontario Hydro existing and other, to what extent does this total look at the available energy look at all those other sites; does it at all?

MR. FLOOK: A. Yes.

Q. So that it is a study of all sites in Ontario?

A. That is correct.

Q. So you say there are some 2,000 dams and those have all been studied then?

[10:50 a.m.]

A. Of all the sites in Ontario that people have perceived as reasonable to develop hydroelectric potential at, they have been included in both Exhibit 438, which is the MNR's, and which Ontario Hydro has included in Exhibit 82, which is the similar documentation of hydroelectric power resource of the Province of Ontario.

Q. We tried to do a calculation last night based upon...

A. Just one point. The 2,000 dams are not necessary dams all associated with hydroelectric facilities. There are many dams that do other jobs within Ontario which have the same safety aspects and concerns, and they may be to hold mine tailings, et cetera, and of course they are not potential hydroelectric sites.

So the 2,000 dams are that, 2,000 dams. They may not all be associated with hydroelectric or water.

Q. I appreciate that.

We found that it seemed to be a fairly constant 1.5 or 1.6 times flow that came out right down that whole list of less than 5 megawatt sites.

A. I'm sorry, I don't know what you are talking about.

THE CHAIRMAN: Where are we looking at now, please?

MR. TRIVETT: I am just getting it, Mr. Chairman.

We calculated it at about a quarter, 125 sites. I am just trying to find, Mr. Chairman. I'm sorry, I should have had it out.

Sorry to waste your time, Mr. Chairman. I am the culprit.

I'm sorry to hold you up. Table 2, Exhibit 359.

THE CHAIRMAN: Just a moment.

MR. TRIVETT: Page 36. I think we have numbered the pages in it.

THE CHAIRMAN: What is the question?

MR. TRIVETT: Q. We found that when we tried to verify the capacity in megawatts in the first column, the first and third, that when we multiplied the 50 percentile number in the Exhibit 438, by 1.6, we came out -- 1.5 to 1.6, we came out with substantially these figures which were shown, which show them to be pretty much of a standard calculation rather than any particular examination which would have shown considerable variation in some sites presumably.

Is that a wrong conclusion?

MR. FLOOK: A. I'm sorry, could I just go over it?

You are saying you looked at page 36 and did a calculation of all of them?

Q. No, we did 25 out of the total of 125 as being a reasonable sample. We did some on each page.

A. That may be so. If you look at all the sites that were generated, the numbers were generated using a specific formula here. And that's case of these are under 5 megawatts and I would tend to believe that most of those sites were -- the information was generated based upon the information as given in Exhibit 82.

Q. So that a different study of those sites particularly where there is a series on the river such as the Mississippi, and so on, could result in quite a different capacity.

Is there any study, for example, of doing a river like the Mississippi and what my client calls lock-step?

A. I don't know what lock-step means.

Q. I think you referred to it in your material as in-step?

A. In-step, yes.

I'm sorry, the small sites Ontario Hydro hasn't done site-specific studies of, and they have just used the generation of information on energy first as described in my direct evidence, and then from that using also as indicated in my direct evidence and in Exhibit 82, then came up with a potential capacity for that site.

As you say, it is larger than if you just took the average energy and so we took into consideration that there would be some, I will call it, peaking or a variation in the operation of the plant.

Q. Thank you. There is one other aspect and that's the change in the efficiency which you decide to use in your calculation. That would also increase or decrease the theoretical available energy? That's based on a decided percentage; is it not?

A. Yes, and that is described in those first 13 pages of Exhibit 438 and it indicates the efficiency that they use.

Q. Right. So assuming a certain efficiency is a governing factor, you arrive at one result, and if you have an opportunity to change that efficiency, then you could have a change in the energy available from all of that calculation?

A. Of course water power conversion of

falling water to electrical energy is quite a mature technology, so the efficiencies are quite well-known and they are not too variable. And therefore the efficiency one scientist may use to develop his numbers and another scientist tend to be very close together. So a few per cent change in efficiency may not make a significant difference in the energy.

Q. What you have appended to 438 then, at page 3, shows that these are calculated in assumed 88 per cent efficiency.

A. That is what they say there.

Q. And you have a notation on it that we use 82 per cent efficiencies.

A. That's correct.

Q. That's a reduction. What is the reason for the reduction?

A. We thought we would be conservative in that they are water flows that you are assuming using the drainage area coefficient, we assumed we would be -- a small amount of conservatism in our estimate, so we applied that factor.

But it then balances out elsewhere because we of course use an average flow which is different from the 50 per cent flow, and we end up with a larger energy.

Q. Which efficiency do you use in calculating what you could do with pumped generation?

MR. SNELSON: A. I'm sorry, I missed the question.

Q. Which efficiency would you use in calculating what benefit you would have from pumped generation, because you don't have the flow problem?

A. Well, pumped generation uses energy and so is -- there is a cycle efficiency, but that's the ratio of the energy that comes out to the energy that goes in. And that cycle efficiency of pumped storage is generally in the range of 70 to 80 per cent because there are so much energy conversions that are required in taking electrical energy, converting it to mechanical energy, using that mechanical energy to pump water, then converting that potential energy of the stored water back to mechanical energy and then converting it back to electrical energy. So that complete cycle has many energy transformation processes and the cycle efficiency is usually in the range of 70 to 80 per cent.

Q. Mr. Hunter just did the calculation, and if you do it at 82 you will have 67 and if you do at 88 you have 77.

A. I am sorry, if you do what?

Q. Apply the 82 per cent efficiency or the 88 per cent efficiency up and down.

A. That's presuming presumably that the pumping cycle has an 82 per cent efficiency and the generating cycle has an 882 per cent efficiency, and I haven't done the calculation, but that will show the product of those two would be the efficiency of the cycle in that particular case.

Q. I think we will leave that subject for the moment, Mr. Chairman, and go on.

I wanted to ask you some questions, Mr. Snelson, about pumped storage, and we have an exhibit here.

If you would look at page 14509, Volume 83.

A. If the page number is 14509, then it's Volume 82, I believe.

Q. 82. I thought it was 82. Thank you.

MR. HUNTER: Where should I put this up?

MR. TRIVETT: Perhaps we should put it up on the Board over there where Mr. Snelson can look at it closely, Mr. Chairman.

THE CHAIRMAN: Maybe Mr. Snelson and Mr. Harris would like to trade places.

I thought we were in Volume 83, 14509.

MR. TRIVETT: I'm sorry, it's.

THE CHAIRMAN: Volume 82, I mean.

MR. TRIVETT: Volume 82. The particular part I want to refer to is on 14510.

THE CHAIRMAN: I'm sorry, 1451...

MR. TRIVETT: 10, starting at the top of the page, Mr. Chairman.

Q. At the top of that page, Mr. Snelson, you said:

"It requires pumps to move the water from the lower reservoir to the upper, and these would be driven by electric motors that use electricity.

"It also requires turbines and generators to generate electricity as the water is allowed to fall back..."

Now, we have here a Voith generator.

THE CHAIRMAN: I'm sorry, a what?

MR. TRIVETT: V-O-I-T-H.

THE CHAIRMAN: You are now referring to a diagram. That diagram, I guess, should have an exhibit number.

MR. TRIVETT: I think so, Mr. Chairman.

THE CHAIRMAN: That will be 440.

---EXHIBIT NO. 440: Voith Diagram.

THE CHAIRMAN: Is that the only copy of it?

MR. TRIVETT: I'm sorry, that's all that we have, Mr. Chairman.

Q. Looking at that exhibit there seemed to be only two chambers and yet it does, we understand, the pumping in both directions. I wondered if what you had said at page 14510 is more complicated than the pump generator really is.

MR. FLOOK: A. Depending upon the specific site you may be fortunate in which you can use the generator, the electrical equipment on top can act as both the generator and the motor, and in this case where you have a high enough head, the turbine runner, which is as the head is highest, squished down much like a pump impeller, the impeller then can be used for both pumping and as turbine.

In other cases, depending upon the head, there may be great inefficiencies in doing that and you may then have the same electrical device on top being both the motor and the generator, but in actual fact you may then use some different -- two separate devices in some other schemes at the lower part. And that of course the engineer in analyzing the project would have to look at those things.

But in this case, obviously they have been fortunate and they can use -- the electrical device at top acts as both the generator and the motor, and the water part down at the bottom acts as both the turbine and the generator.

DR. CONNELL: And the pump.

MR. FLOOK: Excuse me, and the pump.

MR. TRIVETT: Q. And for the Delphi Point have you made a study, is this not the type of equipment that can used there?

MR. FLOOK: A. I don't believe that anybody has looked at it in that detail.

Q. So has pumped generation then been looked at in detail as an alternative?

A. From a planning point of view.

Q. Pardon?

A. From a planning point of view.

Q. Yes. What do you mean from a planning point of view? You decided without ever finding out what it costs?

A. Very preliminary, very preliminary studies. No real evaluation of equipment.

THE CHAIRMAN: From a planning point of view, the evidence of this witnesses, if I understand it, is that load shifting is a preferable way to go.

That's cutting it down to the simplistic.

Is that correct, Mr. Snelson?

MR. SNELSON: That's correct.

MR. TRIVETT: Q. But if you have a cost associated that, how do you compare it with the costs that would be associated with pumped generation if you don't have a detailed plan?

MR. SNELSON: A. There have been estimates prepared for pumped storage schemes as part of the demand/supply option study and that was reported in Exhibit 57, which is the demand/supply option study, the option was number 652 SP, and that report was published by system planning division in February 1986, and that did have preliminary costing for some pumped storage schemes in that option study.

[11:12 a.m.]

MR. FLOOK: A. Just a comment. I went and looked at it. The head on that particular plant is some 378 metres and I think if you look -- and that's very high.

THE CHAIRMAN: I'm sorry, what is that particular figure?

MR. FLOOK: The drawing that's associated with that particular turbine, a very, very high head, Exhibit 440. And if I just look at, sort of the Delphi

Point area, you are looking at 60 metres, somewhere in that area, a much lower head and I think, just from my own technical knowledge, I think you would have difficulty applying that technology, the technology dated in Exhibit 440 with the Delphi Point scheme.

DR. CONNELL: It worked for the CN Tower.

MR. FLOOK: That's true.

MR. TRIVETT: Q. Well, if you can achieve that kind of elevation with that kind of equipment, are you suggesting that you have a problem with doing a lesser elevation with that equipment?

MR. FLOOK: A. That is correct.

Q. What is the head at Niagara then?

A. I have to convert from metric to imperial here. The pump generating station at Niagara has about a 24 metre head.

Q. Do you require the double set of motors and pumps at Niagara, or do you --

A. Of course, they use a completely different -- a turbine called a Deriaz - and offhand, I'm sorry, the spelling doesn't come to me - unit which has variable blades that come off a main crown down at an angle and the blades are variable to adjust for the pumping.

Q. So is it essentially a two chamber

operation?

A. No, that one is one chamber.

Q. One chamber?

A. Yes.

Q. So it's even simpler?

A. Actually, I think it's more complicated because that seems to be the only one that there is in existence, so obviously if it was a good idea it may have been picked up -- my own opinion is that it may have been picked up elsewhere.

Q. But do you have separate pumps. You know, the listing that we have here --

A. No, the generator and the motor are the same device.

Q. So there are a number of choices of exactly the same type of operation or a comparable type operation to what we are showing here?

A. Depending upon the head.

Q. Then am I correct in understanding that it is the same unit for the turbine and the pump at Niagara just it's a variation, it's a different kind of variation than this?

A. That is correct.

Q. Yes, thank you.

MR. SNELSON: A. I might just add, Mr.

Trivett, that I was well aware of these types of arrangements when I gave my direct evidence, I just didn't want to complicate the discussion.

The discussion on page 14510 is one of the principles of pumped storage, and I was not really discussing the details of the ways in which those principles could be implemented.

Q. Thank you, Mr. Snelson.

MR. TRIVETT: I was going to another set of questions, Mr. Chairman. I was wondering if you wanted to take your break now.

THE CHAIRMAN: Well, we stop usually at 11:30. We will stop around that time, if we could. You can get started.

MR. TRIVETT: All right.

THE CHAIRMAN: We will stop at 11:30.

Unless you would prefer to take a break now?

MR. TRIVETT: Well, it doesn't really matter, Mr. Chairman, whatever you want. It may give you a problem of where to break in, and I have got it ready to go if I can just find my page here.

I have just buried my papers here, Mr. Chairman.

THE CHAIRMAN: Perhaps it might be better

if we took the break and then that would give you a chance to organize your next line of questions.

MR. TRIVETT: We have just about got it, Mr. Chairman.

THE CHAIRMAN: Fine. We will take the break now.

THE REGISTRAR: Please come to order. The hearing will recess for fifteen minutes.

---Recess at 11:20 a.m.

---On resuming at 11:35 a.m.

THE REGISTRAR: Please come to order. This hearing is again in session. Be seated, please.

MR. FLOOK: Mr. Chairman, over the break I was looking and I gave one piece of misinformation.

When I gave the head at Delphi Point I had looked at the other alternative, Meaford, which is in the exact vicinity which has a head of 55 metres and Delphi Point actually has a head of 280 metres.

DR. CONNELL: Two hundred and...?

MR. FLOOK: 80 metres.

THE CHAIRMAN: Mr. Trivett?

MR. TRIVETT: Thank you, Mr. Chairman.

Q. Mr. Snelson, if I could refer you to Volume 82, page 14492, line 3, where you used what you admittedly categorized as a crude, some 1,000 miles

east to west, 1,000 miles north to south, and a difference of a little over 1,000 feet.

We have here a map, Mr. Chairman, which may be of assistance to the Board. I only have three copies of it and I have given one to Mr. Snelson and Mr. Flook.

THE CHAIRMAN: What is this map intended to demonstrate?

MR. TRIVETT: Merely the elevations, Mr. Chairman.

THE CHAIRMAN: You mean you are quarreling with the estimation of the --

MR. TRIVETT: Yes. In the area of the headwaters of the Trent, the Black River system, the Madawaska and there's one more chain flowing to Georgian Bay, we have elevations of the lakes that are 1,450 feet.

THE CHAIRMAN: Sorry, of the lakes?

MR. TRIVETT: Yes, quite apart from...

So the headwaters --

DR. CONNELL: Above sea level?

MR. TRIVETT: Pardon?

DR. CONNELL: Above sea level?

MR. TRIVETT: Above sea level. Which is, you know, 450 feet above the thousand feet.

Q. And while it's admittedly these are the small headwater lakes, the dams on these, if we can take the Trent as an example, I would note that some of the lakes -- Lake Louise with the 1,450 is the Madawaska system, the larger lakes like Kennisis on a considerable chain is 1,212 feet, and the other chain I can't recall the name of, it starts at 1,375 feet. So that it seemed to me that we have very considerable elevation of admittedly relatively smaller flow waters when you compare them with Niagara, but the drops of these waters are of the order of Niagara's drop above the thousand feet.

I thought that while, you know, you have called this a rough rule of thumb, it seems to me that we have considerably more elevation than that available to us in our headwaters area of Ontario.

Do you quarrel with that?

MR. SNELSON: A. No, I knew the number was a few hundred feet above the thousand feet. The only purpose of putting that into the direct evidence was in contrast to the sort of elevation differences that you would have, for instance, in a mountainous area where you have differences of several thousand feet.

So it was not intended to be a very

accurate figure, it was only intended to indicate an order of magnitude.

Q. Well, if we take the stream flow of the Trent itself, which we calculate as running from about 200 cfs in the upper waters to 4,000 in the lower reaches, it seems that you can develop something of the order of 9 megawatts for every hundred cfs per thousand feet of drop; is that correct?

Can't answer that kind of a question without background?

A. I would need to do the calculations and maybe others on the panel would do them faster than I could.

Q. Well, it's 600 feet of fall. Perhaps it would help people if they had the --

MR. FLOOK: A. I guess there's some concern about your volume or quantity of water in the first place.

Q. Yes.

A. Of course, the water is like your hand, there's little bits coming down a number of streams, and it's not until far down the system that it gets altogether, and perhaps that's where you start seeing hydroelectric facilities.

Q. Well, if we took the Gull and the

Burnt as an example.

A. Certainly there is a hydroelectric facility on the Gull River, yes.

Q. Right. Now, from there down the system, we calculated there are 33 drops, only two of which are below your less than four-foot level which you suggested you don't develop on, and of those 33, the table which we have been referring to in Exhibit 365, the Table B1, shows development on 8 of those 33 drops.

Now, that admittedly is only Ontario Hydro development and there are one or two others; are there not?

A. I'm sorry, I lost your line of reasoning.

Q. Well, it would seem that we have here on the Trent alone a 590 foot drop and we have only developed power on less than 80 metres, about half.

A. Perhaps --

Q. About half?

A. I couldn't comment on it offhand without looking through all the numbers.

These are at the various dams that the federal government operates?

Q. A number of them are, yes, in

connection with the Trent.

A. I couldn't comment on it. I haven't done the arithmetic on it.

Q. Can you not do that calculation combined of the drops not included in the falls which are listed here? I know one still has to do assessment of particular sites.

A. I'm sorry, how do you mean combined?

Q. Well, you have approximately a 600-foot drop and you have some 240 or 250 feet of that drop which is developed, and so it leaves you with approximately half of that water system -- a capability equal to half of that water system, or equivalent to what is already developed which is undeveloped on that system.

A. I'm not disputing your numbers, I just said I don't know them so I can't confirm them. I'm not disputing your numbers.

Of course all these structures where there is drops are federal government, or I believe they are federal government structures.

Q. Yes, they are.

A. Of course, they would be the arbiter of who can develop those sites.

Q. Well, it is my understanding that we

talked in the -- in Ms. Quinn's introduction she talks about the development of this resource and we have here a proposal to the year 2014 and we have here a river system with dams on it and no talk about any -- looking at the development of that particular system for this kind of a flow or this kind of a drop.

A. I think when we talk about attainable development there are no particular sites associated with that number in this hearing.

Q. Can you tell me whether there is any study that is ongoing in Hydro at the present time of development of the remaining fall on the Trent?

A. I really don't know offhand.

MS. BASU ROY: A. Maybe I could just help out a little bit here. In Exhibit 359 where we have a detailed listing of all the sites where we have identified potential, there is a number of sites where there is potential identified yet to be developed on the Trent River.

Q. Well, with all head ponds on the Trent what rate would you apply to that, the 1.6 which is general or the rate which you have achieved on the Ontario Hydro sites?

MR. FLOOK: A. I'm sorry, I'm not certain what you mean.

Q. Well, when we went back through the earlier calculation we found that we were using really a 1.5 or 1.6 factor but the Ontario Hydro sites are producing significantly more than that.

Not able to confirm that?

A. I don't think there's any particular --

MS. HARVIE: My recollection, Mr. Chairman, is that the 1.6 was Mr. Hunter's number and Mr. Flook wasn't able to confirm it one way or the other.

MR. FLOOK: There was no particular factor applied. The results may have ended up in a ratio that, when you look at a whole lot of them, they are in a similar value.

If I may be of assistance. Because those dams are federal dams and they are associated with a navigable water system, they have put those dams there for their use, therefore, anybody who is going to develop those sites would have to use the water at the rate that they wish to pass the water through those sites.

So, therefore, the amount of energy would have to tie in with what the federal government wishes to operate those structures as.

[11:50 a.m.]

MR. TRIVETT: Q. But in view of the evidence, as I understand it, is that the dams are 90 per cent of the cost of putting in the hydro, one would think that one would look at these dams as being an economic place to start developing.

MR. FLOOK: A. I believe as Ms. Basu Roy indicated, they are in the inventory.

Q. But you don't know what rate they are in the inventory?

A. There is a capacity and energy value indicated in the inventory.

Q. What is that?

THE CHAIRMAN: It's Exhibit 359, it sets out the various sites and gives their capacity and energy.

MR. TRIVETT: Yes, and we have calculated that as being, as it turns out, 1.6, but they seem to be unable to confirm that, Mr. Chairman.

Q. It may not be a fair question, but has Ontario Hydro come to any conclusion as to what the limits of generation are in Ontario, whether it is possible to double the system they have got or increase it by what percentage? Is there any study that indicates just how much hydraulic you consider there to

be left available in Ontario?

It would seem to me on the basis of what you have told me, that you would not have tried to arrive at any such conclusion.

MR. FLOOK: A. I believe the inventory is an indication of the theoretical potential that there is in Ontario. And once against, it's based upon some assumptions somebody has made on certain sites of the height and things like that.

THE CHAIRMAN: Am I right that's Exhibit 82 as updated by 359?

MR. FLOOK: 82 and -- both. I wouldn't say updated -- I am getting mixed up.

It is as shown in Exhibit 82 and then also what the MNR has indicated in Exhibit 438. And 359 does update it, yes.

THE CHAIRMAN: Sorry, I didn't mean to interrupt, Mr. Flook.

Do you have something else you wanted to say in addition?

MR. FLOOK: No. I had to come back in my memory of the numbers of exhibits.

MR. TRIVETT: Q. Well, the problem that Mr. Hunter is trying to understand is when you take a station like Bobcaygeon on the Trent, you come out with

a developed capacity of about six or seven times the flow, and yet the stations which you have included in theoretical inventory seem to be in there at about 1.6 times, 1.5.

I don't know whether you can confirm that, but that's our calculation.

THE CHAIRMAN: Perhaps we could start with your Bobcaygeon. What are you relying on for your Bobcaygeon statement?

MR. TRIVETT: That's Exhibit 359.

THE CHAIRMAN: Yes.

MR. TRIVETT: Page 44, that's Table 2. It's item 93 in that table, small hydro less than 5 megawatts. If you then look at Bobcaygeon in 438 --

THE CHAIRMAN: Wait a minute now. Hold on.

So that's item No. 93; is that right?

MR. TRIVETT: That's item 93, yes, Mr. Chairman.

THE CHAIRMAN: Now we go to 438; is that the next place we go?

MR. TRIVETT: Right. Page 63.

THE CHAIRMAN: Page 63.

MR. TRIVETT: List of water powers in Ontario.

THE CHAIRMAN: I'm sorry, what page?

MR. TRIVETT: Bobcaygeon is the top of the page?

THE CHAIRMAN: What page on Exhibit 438?

MR. TRIVETT: 63, Mr. Chairman.

MR. FLOOK: There are numbers at the bottom of the page, there are some at the top also, which is confusing.

THE CHAIRMAN: I have got it now.

MR. TRIVETT: We are under the heading Trent Canal, Bobcaygeon, Lock 32.

THE CHAIRMAN: Yes?

MR. TRIVETT: Go across to the 50 percentile you have a development of 490 kilowatts which is .49, megawatts.

THE CHAIRMAN: 490? What are you comparing that figure with?

MR. TRIVETT: With the figure that we have in 93 on the exhibit which shows .69.

THE CHAIRMAN: Those are different things, one is energy and the other is capacity.

MR. TRIVETT: That's right.

MR. FLOOK: That is correct.

MR. TRIVETT: What we are saying is that it's in at 1.6, that figure works out as being about

1.5, 1.6 -- 1.41.

THE CHAIRMAN: The energy is shown in 359 as 344, that would be comparable with the 490; that's what you are saying?

MR. TRIVETT: Yes, that's right. The figure shown, comparable to .69 and that would be computed to .49.

MR. FLOOK: Yes, that's correct.

As I indicated both in my direct evidence and I think earlier in your questioning of me today, that in the Exhibit 82, if you follow the formulas that the person used in Exhibit 82, converting energy which the calculated first, back to capacity, they didn't use a full -- assumed that they had operated the whole year and they used something as the 5,000 to 7,000 hours, and when you apply that factor it works out that it would be equivalent to a station that would have a capacity factor about 70 per cent. Therefore, there is some assumption that the plant would not operate at its full amount or the average energy amount the whole year, that it actually would have a capacity greater than that.

MR. TRIVETT: Q. So it's not compared with other like plants that are in existence on the Trent, because no particular study had been done of

filling in the Trent dams with like capacities of that which you are using along the Trent today; is that correct?

MR. FLOOK: A. You look at existing sites.

Q. You say there was no study of fully developing the Trent.

A. No.

Q. The point I am trying to make is that on a full study it might be very significantly larger than the capacity as shown on the formula which has been used?

A. As I have indicated earlier, because the structures are there for other purposes, it is unlikely that the person who may wish to develop the hydroelectric potential of this site would have free reign in setting the capacity and what sort of timing of the water passage past a site, they would have to fit it in with what the federal government wishes, and that, I assume, the person looking at the site would take into consideration and come up with appropriate capacity.

Q. That would be true, of course, in your boating season of the year but would it not be true in your peak season of the year. All the winter

flow would be --

A. They still have limitations on water level, and if the low flow is in the winter and they have drawn down all their storage from those lakes you showed further up towards Algonquin Park, then you are at a minimum flow and then you have to make the best use of that flow past that site at that time of year.

Q. But no study of that kind of development has been made to see whether or not an alternative use is available?

A. Not on the whole Trent River system. Ontario Hydro as I described within the SHARP program is looking at their existing sites on the Trent River system and looking at what potential there is at it and what repairs to be made and they are then undertaking upgrading or redevelopment as appropriate.

MR. TRIVETT: I think I am going to leave it there, Mr. Chairman. That's all my questions. Thank you.

THE CHAIRMAN: Thank you, Mr. Trivett.

Do you have any questions?

I assume that there is no other cross-examiner, but if there is, they can identify themselves at this point.

Ms. Harvie, do you plan to have

re-examination?

MS. HARVIE: I do, Mr. Chairman, a very brief one.

Mr. Chairman, I only have a couple of points of clarification, I expect I will be about five to seven minutes.

RE-EXAMINATION BY MS. HARVIE:

Q. The first is the penstock theory that appeared to be advanced by IPPSO. If the witnesses would turn to Volume 91, page 16080, I think that is where the discussion begins.

My questioning will probably be directed to Mr. Flook unless there is anyone else better able to answer it.

The other thing you should get out as well is Exhibit 415, which is a package of materials that was filed by IPPSO, if you can could turn to page 3 of that in particular, please.

Are we ready now?

Mr. Mondrow put before you this page 3, which I am showing here in my left-hand, and this a diagram or penstock or a tube or canal, being a pipe that takes water from point A to point B and over a change in elevation from X to Y as identified on the left-hand margin of the diagram.

Mr. Flook, from a design and operational point of view, would you please tell the Board whether or not this hypothetical scheme is a practical way of capturing potential?

MR. FLOOK: A. There is quite a few problems with this diagram and the assumptions that are made that go into how it works.

First of all, if that shaded area is a canal, of course the water would flow out of it. It would have to be an enclosed structure to carry the water from the higher elevation to the lower elevation.

Secondly, in order to get the water to flow into the upper end of this penstock, you would find that in most cases you would require some sort of a structure to raise the water to an elevation that the water will then be diverted into this penstock structure, and submerged at sufficient depth that air isn't being sucked into the penstock. So, there would have to be, I believe, in most cases a structure across the river at the upstream side even on very small hydroelectric projects.

You then, just looking at this cross-section, you really have to look at the topography of area, and how can you get the penstock from the upper end to the lower end. Assuming that the

powerhouse is connected directly on the bottom, and depending upon the size of the penstock, if it's only taking a very small proportion of the water and it's a small sized penstock measuring, say, under 10 feet in diameter, one of the other problems is, in northern climates, is that freezes up, may freeze up in the wintertime if the flows are very low and you are trying to maintain a minimum flow down the main part of the stream at the expense of the generating facilities, and if you don't have significant flow in the penstocks, then the penstocks could also freeze up.

The other difficulty is, and it gets back to topography, is the distance. Of course there is an economic sizing of that penstock head loss versus what you achieve by taking it some distance downstream, and that one may cancel the other.

The fourth, the next item is that associated with is back to the discussion that was carried on at the time, was that the assumption is that that is maintaining of a flow in the main part of the river and that only what is surplus to the environmental ecological needs of the river as it's being passed down this penstock, which perhaps may limit the energy that is obtained from this particular scheme.

Q. Fine. Thanks.

DR. CONNELL: Excuse me, if I could ask a question.

MS. HARVIE: Yes.

DR. CONNELL: Mr. Flook, if you were going to impose your own design, assuming you wanted some peaking potential, it might make more sense to try to have a canal structure at a higher level and a penstock over with a much steeper pitch; is that....

MR. FLOOK: It's very site-specific and depends upon the topography of the area. If there is sufficient high topographic areas adjacent to the river that you could carry the water via a canal, such as Niagara Falls, and even at Niagara Falls you have a structure to sort of raise the water to divert it down into the canal area, if you have such a circumstance, then you could use the canal. If the topography is falling off all the way but there is a natural spot to lay a penstock and put powerhouse facilities downstream, then the penstock alternative is the only one that you may have as an option.

MS. HARVIE: Q. All right. Would you please turn now to Volume 92.

[12:14 p.m.]

This is during the cross-examination of

Energy Probe, and if you would turn in particular to page, I guess, 16379 and the two or three pages following that.

Yes, this question should probably be best put to Mr. McCormick.

Now, Mr. McCormick, you were asked by Mr. Mattson why the operation of two stations, the Alexander on the Nipigon River and Little Long on the Mattagami River, were described in a draft MNR document, being Exhibit 427 - you don't need to turn the exhibit open, I don't think - but why those two stations were described as a matter of public issue.

And your answer was that a few years ago at Alexander there had been slumpage on the banks of the Nipigon River and that studies were underway to address the issue, and that with respect to the Little Long station there was a problem with the passage of a number of sturgeon through a control structure and, again, steps had been taken to alleviate the problem and to prevent it from recurring.

Do you recall that evidence?

MR. McCORMICK: A. Yes, I do.

Q. All right. Would you tell the Board, please, whether or not the extent or severity of the problems associated with those two stations is

characteristic or typical of hydroelectric stations?

A. Those are very much unique circumstances. In the case of the Nipigon, the problem of slumpage was attributed to several factors and not strictly the operation of Ontario Hydro facilities. In fact, there was a pipeline that was constructed at the top of the banks which contributed to this.

I believe there were two other factors, one of which was the operation -- water level fluctuations at the foot of the bank, but the combined effect resulted in this slump.

In the case of the Mattagami, we have a unique situation as well where there is a major diversion called the Adam Creek diversion where flows that cannot be handled by the existing four stations bypass down that channel, and in one particular year it is apparent that quite a number of sturgeon did enter into the channel because of the operation of the control structure.

We monitored it again this past year, the event did not occur. It seems to, under certain conditions, timing of the spill, which really is related to differences from one year to the next as to when the spill occurs and whether the sturgeon are present in the area at that particular time.

Usually in the spring they're further upstream spawning, but this particular year the spill was late, such that the sturgeon had returned to the headpond and were, therefore, more susceptible.

But, again, it's unique because there are very few diversions of this kind within the province. So it's not a typical problem with hydroelectric facilities.

MS. HARVIE: Thank you. Those are all my questions, Mr. Chairman.

THE CHAIRMAN: Thank you.

That then completes the Proponent's evidence on Panel 6. Next will be Panel 7 which will start at 10:00 a.m. on Tuesday, January the 7th, to be preceded by, at that time, the motion with respect to the notice of hearing.

So we can now adjourn.

THE REGISTRAR: This hearing is now adjourned until Tuesday, January the 7th at 10:00 a.m.

---Whereupon the hearing was adjourned at 12:20 p.m., to be reconvened on Tuesday, the 7th day of January, 1992, at 10:00 a.m.

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